Exemption No. 5473

UNITED STATES OF AMERICA
DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
FORT WORTH, TEXAS 76193-0100

In the matter of the petition of ROBINSON HELICOPTER COMPANY for an exemption from §§ 27.955(a)(7) and 27.1305(q) of the Federal Aviation Regulations	Regulatory Docket No. 006SW

PARTIAL GRANT OF EXEMPTION

By letter dated March 20, 1992, Mr. F. D. Robinson, President of Robinson Helicopter Company, 24747 Crenshaw Blvd., Torrance, California 90505, petitioned for an exemption from §§ 27.955(a)(7) and 27.1305(q) of the Federal Aviation Regulations (FAR) that require an indicator for contamination of the fuel filter and the associated testing.

The petitioner requests relief from the following Sections:

> Section 27.955(a)(7) states, in pertinent part, that the fuel filter required by § 27.997 must be blocked to the degree necessary to simulate the accumulation of fuel contamination required to activate the indicator required by § 27.1305(q).
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> Section 27.1305(q) states, in pertinent part, that an indicator is required for the fuel filter required by § 27.997 to indicate the occurrence of contamination of the filter at the degree established by the applicant in compliance with § 27.955.

The petitioner supports his request with the following information:

> The R44 uses a fuel system that is similar to the very reliable R22 gravity feed fuel system. The pressure head of the system at the carburetor is less than one-half pound per square inch (psi) under critical conditions (approximately 18 inches head of fuel). A blocked filter indicator would require a transducer or other device with the capability of

measuring a pressure differential across the gascolator of considerably less than one-half psi. An acceptable transducer cannot be located that will function properly at this very low fuel pressure differential and the various flow requirements experienced at different power settings.

Use of such an indicator in a gravity feed fuel system cannot be found, and the FAA has been unable to locate any such examples in response to requests.

FAR 27.1305(q), prior to Amendment 27-23, applied to turbine engines only, and Amendment 27-23 does not address gravity feed fuel systems. FAR 23 does address gravity flow; therefore, it is proposed that compliance with § 23.955(b) be demonstrated, using the procedural guidelines of AC 23.955-1.

It is proposed that the minimum fuel flow rate for this gravity feed system be 150 percent of the takeoff power fuel consumption with the aircraft at it's most critical attitude. It is also proposed that an additional margin of safety be shown by conducting the fuel flow test with a gascolator screen that has been blocked by 50 percent.

SAFETY: A forced landing is more critical for a light fixed wing airplane than it is for a helicopter. By demonstrating the same level of safety as that required by § 23.955(b), compliance with the intent of § 27.955(a)(7) will be shown. RTR 416 "Fuel System Substantiation...R44 Helicopter" provides the technical details of the testing that will show how an equivalent or greater level of safety will be met. Experience with an almost identical fuel system on the R22 has demonstrated a high level of reliability and safety of the gravity feed fuel system.

The approach proposed for the R44 fuel system substantiation will not adversely affect safety and will result in a level of safety equal to that provided by the rule from which this exemption is sought.

PUBLIC INTEREST: The public is served by keeping down costs, while maintaining a high level of reliability. The use of the well-proven gravity feed fuel system will be more reliable and more cost-effective than the complex pressure pump system. Operating costs are highly dependent upon the first cost of acquisition, and the economic benefits will extend throughout the economic future of the aircraft without degradation of safety levels. It is expected that the R44 will develop a substantial foreign export market.

Based upon the above, it would be in the public's best interests to grant an exemption from the provisions of §§ 27.955(a)(7) and 27.1305(q) and instead demonstrate compliance with the provisions of § 23.955(b) with the approach detailed in RTR 416.

A summary of the petition was published in the Federal Register on June 2, 1992 (57 FR 23252), and a correction to the summary was published in the Federal Register on June 16, 1992 (57 FR 26887). No comments were received.

The Federal Aviation Administration's (FAA's) analysis is as follows:

Amendment 27-9 to FAR 27, became effective on October 1, 1974 (39 FR 35462), and added paragraph (q) to § 27.1305. This new paragraph established the requirement for an indicator on the fuel strainer or filter to indicate the occurrence of contamination of the strainer or filter before it reached a level that would affect engine operation. This paragraph was applicable to turbine engine rotorcraft.

On November 27, 1984, a Notice of Proposed Rulemaking (NPRM) was published in the Federal Register (84 FR 46680) to change § 27.1305(q) so that it would apply to all rotorcraft (not just those with turbine engines) and allow the applicant to establish an indicator which would be compatible with other fuel system parameters involved with demonstrating compliance with § 27.955. No comments were received concerning the proposed changes to § 27.1305(q), so they were incorporated into the rule by Amendment 27-23, which became effective on September 2, 1988 (53 FR 34214).

On June 16, 1986, Robinson Helicopter Company (RHC) applied for type certification of the R44 helicopter and then withdrew the application. On March 4, 1987, RHC reapplied for certification of the R44, and the certification basis was established as FAR Part 27 through Amendment 27-21, Change 16, effective December 6, 1984. On February 7, 1990, a request for an extension of the certification time interval was requested. On February 27, 1990, the extension was granted with a stipulation that if certification continues beyond October 3, 1991, the certification basis would change and additional requirements may be imposed depending upon the actual date of certification. The type certificate was not issued by October 3, 1991; and on September 12, 1991, Issue Paper P-1 was written adding Amendment 27-23 to the certification basis for the R44. The R44 became the first helicopter that must meet the new contaminated fuel filter indicator requirements of § 27.1305(q).

The R44 design is a reciprocating engine helicopter that incorporates a gravity feed fuel system. There are no fuel or

boost pumps in the system. As a result, the fuel supply pressure is extremely low and it does not permit conventional design approaches to be used for providing a contamination indicator for the fuel filter.

As a result of inquiries from RHC regarding a suggested means of compliance with § 27.1305(q), the FAA researched the history behind Amendments 27-9 and 27-23 to determine the exact scope and intent of these changes. The FAA finds that the original intent of the rule change was to apply the new requirements to all rotorcraft regardless of the type of engine being used and that the indication of fuel filter blockage must be provided to the flight crew. Even though the intent of the rule was to make the fuel filter contamination indicator requirements compatible with other fuel system parameters, there is no evidence that gravity feed fuel systems were specifically considered. Amendment 27-9 was applicable to turbine engine rotorcraft that predominantly utilize suction or pump fed fuel systems. The FAA finds that, when the change to § 27-1305(q) was made and approved in Amendment 27-23, a distinction should have been made by excluding gravity feed fuel systems from the fuel filter contamination indicator requirements. It is anticipated that a change will be made to § 27.1305(q) to reflect this finding.

Because of the potential effect upon aviation safety, the FAA Service Difficulty Reporting (SDR) system was checked for any reports of fuel system contamination on the R22, which has a fuel system design similar to the R44. Three SDR's were found that involved fuel system contamination. An analysis of these three incidents did not indicate any adverse effect upon aviation safety by approving this exemption.

The applicant proposed to comply with § 23.955(b) using the procedural guidelines of AC 23.955-1. The FAA does not agree with this proposal and finds that the requirements of § 27.955, except for paragraph (a)(7), apply to the R44. These requirements are less restrictive and were used for certification of the similar R22 fuel system.

The applicant proposed that the minimum fuel flow rate for the R44 gravity feed fuel system be 150 percent of the takeoff power fuel consumption with the aircraft at it's most critical attitude. The FAA does not agree with this proposal and finds that the fuel flow requirements established in § 27.955, except for paragraph (a)(7), are applicable to the R44.

The applicant proposed that an additional margin of safety be shown by conducting the fuel flow test with a gascolator screen that has been blocked by 50 percent. The FAA does not agree with this proposal and finds that if compliance with the

fuel flow requirements of § 27.955, except for paragraph (a)(7), is demonstrated, then no additional margins of safety are required.

In consideration of the foregoing, the FAA has determined that by granting this partial exemption, public safety will not be significantly affected and has further determined that granting this partial exemption would be in the public interest.

Therefore, pursuant to the authority contained in Sections 313(a) and 601(c) of the Federal Aviation Act of 1958, that has been delegated to me by the Administrator (14 CFR 11.53), Robinson Helicopter is granted an exemption from the fuel filter contamination indicator requirements of §§ 27.955(a)(7) and 27.1305(q) of the FAR. The following limitations apply to this exemption:

1. This exemption is limited to all models of the Robinson R44 helicopter equipped with a gravity feed fuel system.

2. The petitioner must satisfy all other requirements for obtaining a Normal Category rotorcraft type certificate.

This exemption remains in effect until otherwise superseded or rescinded.

Issued in Fort Worth, Texas, on, July 2, 1992.

Henry A Armstrong

Assistant Manager, Rotorcraft Directorate
Aircraft Certification Service